DORIS: Prototype Demo #1

Dylan Boeholt, Andre Bonillas, Connor Davidson,
Jeremy Malmo, Michael Zielinski

Prototype #1: Drone Layout

Question: How will the drone parts and electronics practically fit together? How big will it be?

Methods: MDF cutting, FDM 3D printing with TPU

Answer: The drone will be approximately 44 inches across in current configuration, and approximately 15 lbs in total weight. The layout can be seen in the figure on the next slide.

Moving forward:

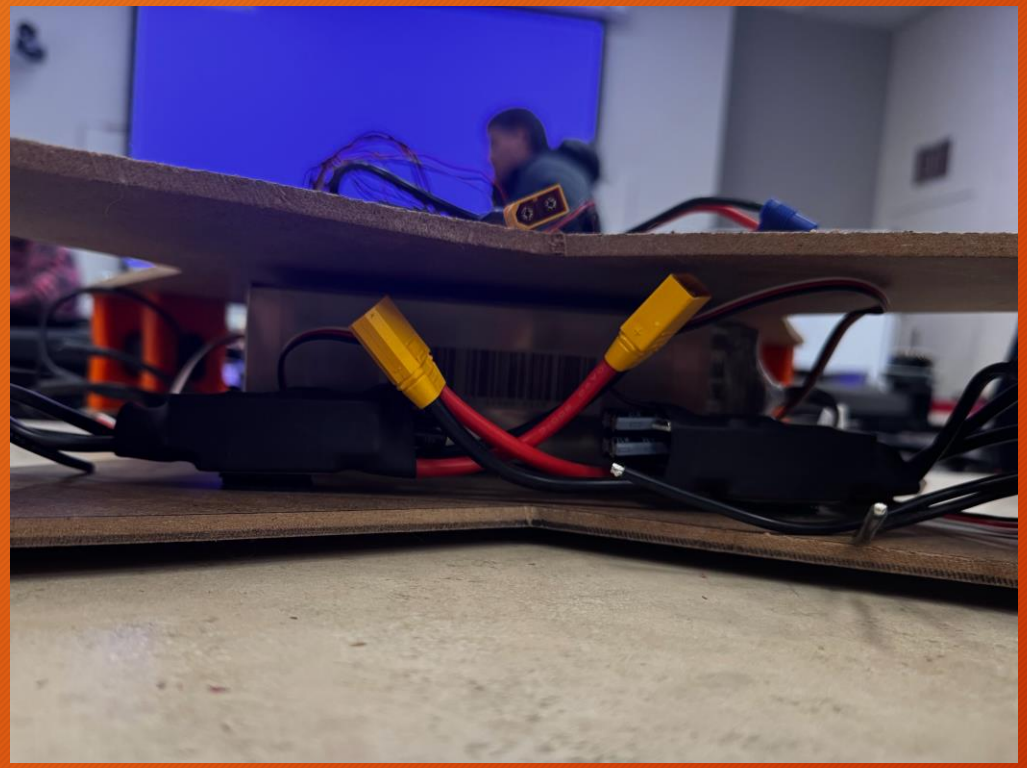
- Carbon fiber frame plates can begin to be modeled with openings for integrated electronics

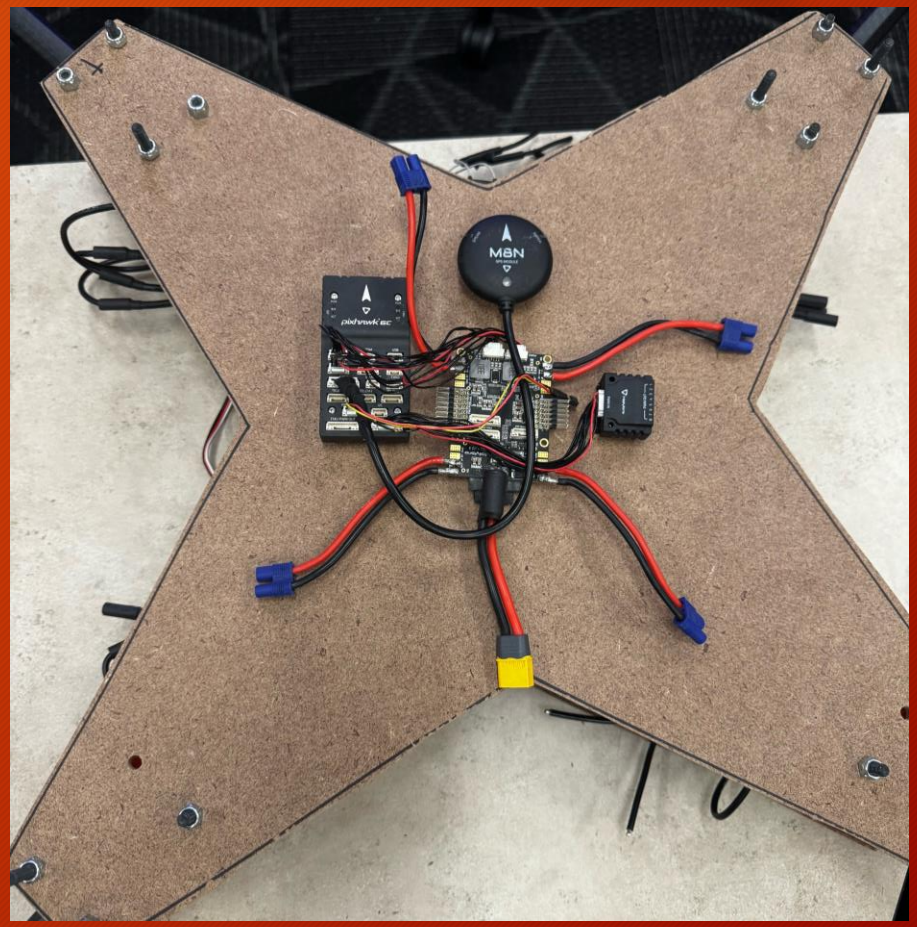
- More standardized bolts need to be purchased for arm brackets

- Arms can be analyzed for stability to determine if they need to be shorter

- Motor mounts will be further refined for manufacturability and needed parameters

Prototype #1: Close-up Images





Prototype #2: Cruise missile

Question: Can we achieve directional control via servos based on cruise missile design documents from AeroJTP?

Methods: FDM 3D printing w/ Lightweight PLA, wiring diagram of missile

Answer: Left/right directional control can be achieved, with the tailerons achieving the designed 80 degree motion (+/- 40 degrees in either direction from neutral)

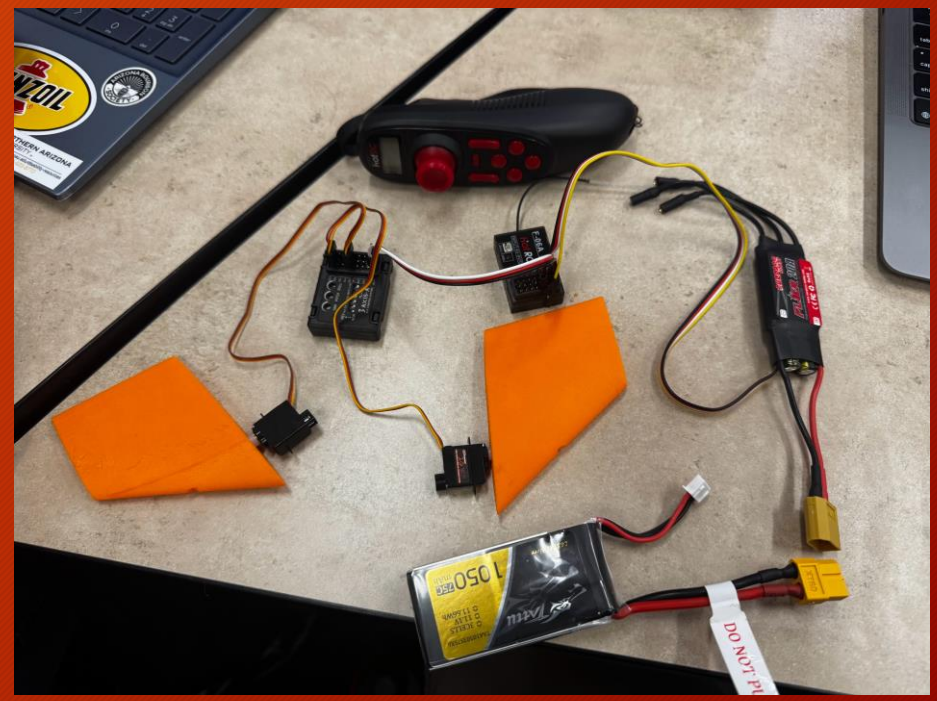
Future work:

- Integration of the control surfaces into the full cruise missile construction

- Construction of the fuselage

- Confirmation of cruise missile flight independent of the drone system

- Can vertical control be achieved with this design?



Prototype #3: Payload Attachment

Question: How can the MagSwitch(es) be attached securely to the frame?

Methods: FDM 3D printing w/ ABS

Answer: Two MagSwitches can be attached via a press fit into a custom designed plate that can be suspended via bolts from the bottom of the drone. The bolts on the plate clear the footprint of the battery above it.

Future work:

- Possibly redesign the plate for 3 MagSwitches for optimum shear force abatement

- Use values from MagJig engineering team for turning force to determine servo motors needed

- Determine servo attachment and test control via flight controller

Team Responsibilities

- Dylan:
  - Design and manufacturing of motor mounts
- Andre:
  - CAD modeling of servo attachment
  - Design and manufacturing of MagSwitch plate
- Connor:
  - CAD modeling of frame plates
  - Manufacturing of MDF frame plates
- Jeremy:
  - Design and manufacturing of arm mounts
  - Mounting hardware selection
- Michael:
  - Manufacturing and troubleshooting of cruise missile electronics/fuselage
  - Design of drone electronics layout (ESCs, Flight Controller, GPS, Power Module)
- All:
  - Final assembly

Thank you!

Questions?